IMAGE FILE APPARATUS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates generally to an image file apparatus. More particularly, this invention relates to an image file apparatus that records and stores an image, which is recorded in a recording medium by a digital camera or the like, in another recording medium.

Description of Related Art

In general, a recording medium such as a memory card for use in a digital camera is relatively expensive, and it is not economical to have a number of memory cards. To address this problem, image data recorded in the recording medium by the digital camera is stored in another recording medium having a large recording capacity (such medium is relatively inexpensive per bit) for use in an image file apparatus.

On the other hand, the number of pixels in an imaging device in the digital camera has been increasing recently, so that image data with a large number of pixels (high resolution) can be recorded in the recording medium. In order to read the image data with a large number of pixels from the recording medium and display the entire image on a monitor such as a CRT display in accordance with the read image data, the image data is reduced and interpolated to decrease the number of the pixels therein to a display size of the monitor.

If an image data with a large number of pixels is read from the recording medium and is reduced and interpolated to decrease the number of the pixels therein to the display size of the monitor every time an image is displayed on the monitor, it takes a long time to access a large amount of data. Moreover, a time

is needed to reduce the data and the like, and therefore, it takes a long time to display the image on the monitor.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an image file apparatus, which is capable of displaying an image in accordance with image data recorded in a recording medium within a short time.

The above object can be accomplished by providing an image file apparatus comprising: a first image data reading device that reads original image data; a converting device that converts the original image data read by the first image data reading device into a display image data in a display size of a display; and an image recording device that records the original image data read by the first image data reading device into a first recording medium, and that records the display image data produced by the converting device into the first recording medium when a size of the original image data is different from the display size of the display.

More specifically, the image file apparatus stores the original image data, and if the size of the original image data is different from the image data size for displaying on the display, the image file apparatus converts the original image data into the display image data by the converting device and stores the display image data at the same time as the recording of the original image data.

The original image data may be read from a second recording medium, which is built in or is detachably mounted in a digital camera. The first recording medium may be built in the image file apparatus, attached to the outside of the image file apparatus, or detachably mounted in the image file apparatus.

In one preferred form of the present invention, the image file apparatus

further comprises: a second image data reading device that reads the display image data from the first recording medium when the display image data has been recorded in the first recording medium, and that reads the original image data from the first recording medium when the display image data has not been recorded in the first recording medium; and a display driver that drives the display to display an image in accordance with one of the original image data and the display image data, the one of the original image data and the display image data being read by the second image data reading device.

More specifically, the original image data is stored in the first recording medium, and if the size of the original image data is different from the display size of the display, the display image data corresponding to the original image data is stored along with the original image data. Therefore, the second image reading device can read the display image data or the original image data in the same display size as the display image from the first recording medium. Thus, the display image data with a smaller amount of data is accessed instead of the original image data with a larger amount of data, and this reduces the access time. Moreover, there is no necessity of reducing or interpolating the image, and thus, the image can be displayed quickly on the display.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature of this invention, as well as other objects and advantages thereof, will be explained in the following with reference to the accompanying drawings, in which like reference characters designate the same or similar parts throughout the figures and wherein:

Fig. 1 is a block diagram showing an embodiment of an image file apparatus according to the present invention;

Fig. 2 is a flow chart of assistance in explaining how an image is stored

in the image file apparatus in Fig. 1; and

Fig. 3 is a flow chart of assistance in explaining how an image is regenerated in the image file apparatus in Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention will be described in further detail by way of example with reference to the accompanying drawings.

Fig. 1 is a block diagram showing an image file apparatus according to an embodiment of the present invention.

As shown in Fig. 1, the image file apparatus mainly has a function for recording image data, which is stored in a recording medium 10, in another recording medium 12, and a function for displaying an image on a monitor apparatus 30 such as a CRT in accordance with image data stored in the recording medium 12. The image file apparatus comprises: drive units 14, 16; a memory controller 18 for images to be displayed; a display memory 20; a video signal output circuit 22; and a central processing unit (CPU) 24.

The recording medium 10 such as a memory card and a smart medium is used in a digital camera. The recording medium 12 such as a magnetic disk, an optical disk and a magneto-optical disk has a larger recording capacity than the recording medium 10 used in the digital camera and is less expensive per bit than the recording medium 10 used in the digital camera. The recording medium 12 should not always be detachably mounted in the image file apparatus, but it may also be built in the image file apparatus or attached to the outside of the image file apparatus.

The drive units 14, 16, the memory controller 18 and the CPU 24 are connected through a bus 29. The bus 29 connects to a user interface 26 for inputting a variety of commands from a user and a printer interface 28 for

transferring image data and the like to a printer (not illustrated).

The CPU 24 unites and controls the circuits of the image file apparatus, and executes conversion, such as reduction and interpolation, for converting image data to decrease a large number of pixels therein to the number of pixels in a monitor apparatus 30 (e.g., 640×480 pixels) and expansion/compression of the image data. Another processing means than the CPU 24 may execute the conversion and the expansion/compression.

The drive unit 14 reads image data (original image data) recorded in the recording medium 10, and sends the original image data to the CPU 24 through the bus 29. The CPU 24 records the original image data in the recording medium 12 through the bus 29 and the drive unit 16. If the number of pixels in the original image data is larger than the number of pixels in the monitor apparatus 30, the original image data is converted to reduce the number of pixels therein to the number of pixels in the monitor apparatus 30. The converted image data (image data for display) is outputted to the memory controller 18 through the bus 29.

The memory controller 18 writes the display image data in a display memory (a video RAM) 20, and repeatedly reads the display image data stored in the display memory 20. The memory controller 18 outputs the read display image data to the video signal output circuit 22. The video signal output circuit 22 comprises a D/A converter for converting the display image data to analog signals and an NTSC encoder. The video signal output circuit 22 generates NTSC video signals from the display image data, and outputs the NTSC video signals to the monitor apparatus 30 through a video signal cable 23. Consequently, an image is displayed on the monitor apparatus 30.

The display image data is recorded in the recording medium 12 through the drive unit 16. Thus, the original image data and the display image data corresponding to the original image data are recorded in the recording medium

12. If the original image data has the same number of pixels as the monitor apparatus 30, only the original image data is recorded.

To display the image on the monitor apparatus 30 in accordance with the image data recorded in the recording medium 12, the display image data is read from the recording medium 12 and is stored in the display memory 20. If the recording medium 12 contains no display image data, the original image data is read and is stored in the display memory 20. In this case, the original image data has the same number of pixels as the display image data.

Then, the image is displayed on the monitor apparatus 30 in accordance with the image data stored in the display memory 20. More specifically, if the display image data is read from the recording medium 12 and the image is displayed according to the display image data, the frequency in access can be decreased since the amount of the data is small. Moreover, the image can be displayed within a short time since there is no necessity of executing the conversion such as reduction of the image data.

Referring next to Figs. 2 and 3, the operation of the image file apparatus that is constructed in the above-mentioned manner will be explained.

When the user inputs a command for storing an image through the user interface 26 by operating a switch, a remote controller or the like (not illustrated) in user's command waiting state at step S10 in Fig. 2, a size (the numbers of pixels in vertical and horizontal directions) of the image to be recorded is read from the recording medium 10 and the image data (the original image data) is read (steps S12 and S14). The image size is recorded in a header of an image file.

The original image data is recorded in the recording medium 12 (step S16). The original image data, which has been compressed in a predetermined format to be recorded, is expanded (step S18).

Then, it is determined whether it is necessary to convert the original

image data to reduce the number of the pixels therein to a display size or not according to the image size of the original image data read at the step S12 (step S20). If it is determined that it is necessary to convert the original image data (if the number of pixels in the original image data is larger than the number of the pixels in the monitor apparatus 30), the original image data is converted (e.g., reduced) to reduce the number of the pixels therein to the number of pixels in the monitor apparatus 30 (step S22).

The converted image data (the image data for display) is compressed in a predetermined format (step S24), and is recorded in the recording medium 12 (step S26). The display image data converted at the step S22 is transferred into the display memory 20 (step S28).

If it is determined that it is not necessary to convert the original image data, the original image data is transferred into the display memory 20 (step S28).

The monitor apparatus 30 displays an image according to the image data for display or the original image data transferred into the display memory 20 (step S30), and the state returns to the user's command waiting state (step S10).

There will now be explained the regeneration of the image according to the original image data or the image data for display, recorded in the recording medium 12.

When the user inputs a command for regenerating an image through the user interface 26 as shown in Fig. 3 (step S50), an image to be regenerated is selected (step S52). The image is selected on an index image, by inputting a frame number, by displaying the next frame or the last frame, or the like.

After the image is selected, it is determined whether there is the image data for display relating to the selected image or not (step S54).

There will now be explained the method of determining whether there is the image data for display relating to the selected image or not.

When the image data is stored in the recording medium 12, a management table file as shown in the following TABLE 1 is produced and recorded in the recording medium 12.

TABLE 1

Management table file	(A, A'), B, (C, C'), ...

In the above management table file, (A, A') and (C, C') indicate that there are the original image data and the display image data. B indicates that there is only the original image data.

If it is determined that there is the image data for display relating to the image to be regenerated according to the management table file, the image data for display is read from the recording medium 12 (step S56). If it is determined that there is no image data for display, the original image data is read from the recording medium (step S58). The original image data has the same size as the display size of the image data for display.

The image data for display or the original image data read in the above-mentioned manner, which has been compressed, is expanded (step S60) and is transferred to the display memory 20 (step S62). The monitor apparatus 30 displays the image according to the image data for display or the original image data transferred to the display memory 20 (step S64).

As stated above, the image is displayed according to the display image data or the original image data, whose data amount is small, read from the recording medium 12, and this decreases the frequency in access at the reading and eliminates the necessity of executing the conversion (e.g., reduction) of the image data. Therefore, the image can be displayed within a short time.

As shown in Fig. 1, the image file apparatus has the printer interface 28, through which the original image data is transferred from the recording medium 12 to the printer.

In this embodiment, the original image data is read from the recording

medium 10 and is stored in the recording medium 12, but this invention should not be restricted to this. For example, the original image data may be captured through digital communication. The monitor apparatus 30 is not necessarily connected to the image file apparatus with the video signal cable 23, but it may also be built in the image file apparatus. The number of pixels in the image data for display should not be restricted to this embodiment. Moreover, if the number of pixels in the original image data is smaller than the number of pixels in the image data for display, the number of pixels in the original image data is increased to the number of pixels in the image data for display by means of interpolation or the like.

As set forth hereinabove, the inputted original image is stored in the recording medium, and if the size of the original image is different from the display size of the image display means, the original image is changed into the display image in the display size of the image display means. In this case, the original image and the display image are stored at the same time. Therefore, in order to display the image, the display image with a small amount of data is accessed instead of the original image with a large amount of data. This reduces the accessing time and eliminates the necessity of reducing and interpolating the image. Consequently, a desired image can be displayed on the image display means within a short time.

The display image is stored with the original image, and the display image is accessed to display the image. Thus, the original image can be backed up.

It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the invention is to cover all modifications, alternate constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.